

# Gustav Nilsson

Postdoctoral Researcher

School of Architecture,  
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## Academic Employment

- September 2021 - Present    Postdoctoral Scientist, Urban Transport Systems Laboratory (LUTS),  
École Polytechnique Fédérale de Lausanne (EPFL), Switzerland.  
Host: Prof. Nikolas Geroliminis.
- May 2019 - August 2021    Postdoctoral Fellow, School of Electrical and Computer Engineering,  
Georgia Institute of Technology, USA.  
Host: Prof. Sam Coogan.
- September 2013 - April 2019    Ph.D. student, Lund University, Sweden.

## Education

- Ph.D. in Automatic Control, Lund University, Sept 2013 – Feb 2019  
*Supervisor:* Giacomo Como.  
*Co-supervisor:* Anders Rantzer.
- M.Sc. in Engineering Physics, Lund University, Sept 2008 – Aug 2013  
Specialized in Mathematics and Automatic Control.

## Research Interests

Modeling, control, and robustness analysis of dynamical flow networks with applications in transportation networks. Non-linear control. Game theory. Ride-hailing and ride-sharing solutions. Operation of electric vehicles.

## Internships

- October 2017 - March 2018: Mitsubishi Electric Research Laboratories, Cambridge, MA. Host: Uros Kalabic

## Longer Research Visits

- September 2019: Dipartimento di Scienze Matematiche "Giuseppe Luigi Lagrange", Politecnico di Torino
- October – November 2018: Dipartimento di Scienze Matematiche "Giuseppe Luigi Lagrange", Politecnico di Torino
- July 2018: Dipartimento di Scienze Matematiche "Giuseppe Luigi Lagrange", Politecnico di Torino
- October and December 2016: Dipartimento di Scienze Matematiche "Giuseppe Luigi Lagrange", Politecnico di Torino
- September – October 2015: Institute for Pure & Applied Mathematics, UCLA
- May 2014: Grenoble Traffic Lab, INRIA Grenoble – Rhone-Alpes.

## Professional Service

IEEE Control Systems Society (CSS) Conference Editorial Board (CEB) – Associate Editor  
FORUM-ISTS2020 – International Program Committee

## Seminars

LAGEPP (Lyon, France), December 1, 2023.  
GIPSA-Lab (Grenoble, France), November 10, 2023.  
DISMA Politecnico di Torino (Turin, Italy), September 20, 2022.  
Ecole Polytechnique Fédérale de Lausanne (EPFL), (Lausanne, Switzerland), April 14, 2021.  
DISMA Politecnico di Torino (Turin, Italy), October 3, 2019.  
Georgia Institute of Technology (Atlanta, USA), February 1, 2019.  
DISMA Politecnico di Torino (Turin, Italy), July 4, 2018.  
Institute of Institute for Pure and Applied Mathematics, UCLA (Los Angeles), September 22, 2015.

## Supervision

### *Mentoring of Ph.D. Students*

EPFL:

Lynn Fayed  
Marko Maljkovic

Georgia Tech:

Cesar Santoyo  
Qinshuang Wei

### *Master's Thesis*

1. Amani Jaafer, "Data-driven system for learning driver behaviors from IMU data", 2019, co-supervisor.
2. Rasmus Stålberg, "On Robustness of Equilibria in Transportation Networks", 2018, co-supervisor.
3. Simon Paulsson, "Tuning Feedback-Based Traffic Signal Controls", 2018, co-supervisor.
4. Christian Rosdahl, "Distributed Control of Dynamic Flows in Traffic Networks", 2017, co-supervisor.
5. Joakim Guth, "On Distributed Maximization of Influence in Social Networks", 2017, co-supervisor.

## Teaching Experience

EPFL:

Fundamentals of traffic operations and control – Guest lecturer and developer of course material.

Georgia Tech:

Nonlinear Control – Fill-in lecturer.  
Network Dynamics – Organizer of a summer reading group for graduate students.

During my Ph.D. studies at Lund University:

Network Dynamics – Teaching assistant three times and involved in the development of the course. Lecturer for part of the course spring 2019.

Physiological Models and Computations – Teaching assistant and involved in the development of the course.

Automatic Control, Basic Course – Teaching assistant four times.

Automatic Control, Basic Course in China – Lecturer for one third of the course and teaching assistant.

During my M.Sc. studies at Lund University:

Calculus in One Variable – Teaching assistant one time.

Calculus in Several Variables – Teaching assistant two times.

Linear Algebra – Teaching assistant three times.

## Pedagogical Training

Over five weeks of pedagogical courses including:

Introduction to teaching and learning in higher education.

Communicating science.

## Reviewer

Reviewer for IEEE Transactions on Automatic Control, IEEE Transactions on Control of Network Systems, IEEE Transactions on Intelligent Transportation Systems, Automatica, IEEE Open Journal of Control Systems, IEEE Control Systems Magazine, IEEE Control Systems Letters (L-CSS), IEEE Transactions on Control Systems Technology, IEEE Transactions on Vehicular Technology, IEEE Transactions on Network Science and Engineering, IEEE Transactions on Intelligent Vehicles, Transportation Research Part B: Methodological, Transportation Research Part C: Emerging Technologies, EURO Journal on Transportation and Logistics, ACM Transactions on Internet of Things, Economics of Transportation, IEEE Conference on Decision and Control (2015, 2016, 2017, 2018, 2019, 2021, 2023, 2024), American Control Conference (2017, 2020, 2021, 2022, 2024), IFAC World Congress (2017), IFAC Symposium on Control in Transportation Systems (2018, 2021, 2024), European Control Conference (2019, 2021, 2022, 2024), IFAC Workshop on Distributed Estimation and Control in Networked Systems (2019), IEEE Conference on Control Technology and Applications (2020), IEEE International Conference on Intelligent Transportation Systems (2020, 2023), AAMAS2024.

## Other Professional Activities

17–18 October 2019: TU Delft Mechanical Engineering Talent Event 2019 (by invitation).

## Publications

### *Peer-Reviewed Journal Papers*

- [J11] **G. Nilsson** and S. Coogan. Feb. 2024. “The Strong Integral Input-to-State Stability Property in Dynamical Flow Networks”. *IEEE Transactions on Automatic Control* 69.2, pp. 1179–1185. DOI: 10.1109/TAC.2023.3277924.

- [J10] **G. Nilsson**, A. D. Owen Aquino, S. Coogan, and D. K. Molzhan. Dec. 2023. “GreenEVT: Greensboro Electric Vehicle Testbed”. Accepted to IEEE Systems Journal. Source code <https://github.com/GreenEVT/GreenEVT>. DOI: 10.1109/JSYST.2023.3343692. URL: <https://arxiv.org/abs/2210.08496>.
- [J9] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. Nov. 2023. “Hierarchical Pricing Game for Balancing the Charging of Ride-Hailing Electric Fleets”. *IEEE Transactions on Control Systems Technology* 31.6, pp. 2728–2743. DOI: 10.1109/TCST.2023.3286330.
- [J8] Q. Wei, **G. Nilsson**, and S. Coogan. Sept. 2023. “Safe Schedule Verification for Urban Air Mobility Networks with Node Closures”. Accepted to IEEE Transactions on Control of Network Systems. DOI: 10.1109/TCNS.2023.3314570.
- [J7] L. Fayed, **G. Nilsson**, and N. Geroliminis. Mar. 2023. “On the utilization of dedicated bus lanes for pooled ride-hailing services”. *Transportation Research Part B: Methodological* 169, pp. 29–52. ISSN: 0191-2615. DOI: 10.1016/j.trb.2023.01.005.
- [J6] C. Santoyo, **G. Nilsson**, and S. Coogan. Feb. 2023. “Resource aware pricing for electric vehicle charging”. *Automatica* 148, p. 110733. DOI: 10.1016/j.automatica.2022.110733.
- [J5] C. Santoyo, **G. Nilsson**, and S. Coogan. Jan. 2023. “Sensitivity to User Mischaracterizations in Electric Vehicle Charging”. *Systems & Control Letters* 171, p. 105412. ISSN: 0167-6911. DOI: 10.1016/j.sysconle.2022.105412.
- [J4] **G. Nilsson** and G. Como. Jan. 2022. “Generalized Proportional Allocation Policies for Robust Control of Dynamical Flow Networks”. *IEEE Transactions on Automatic Control* 67.1, pp. 32–47. DOI: 10.1109/TAC.2020.3046026.
- [J3] G. Como and **G. Nilsson**. Aug. 2021. “On the well-posedness of deterministic queuing networks with feedback control”. *Transportation Research Part B: Methodological* 150, pp. 323–335. ISSN: 0191-2615. DOI: 10.1016/j.trb.2021.06.010.
- [J2] M. Srinivasan, M. Abate, **G. Nilsson**, and S. Coogan. Apr. 2021. “Extent-compatible control barrier functions”. *Systems & Control Letters* 150, p. 104895. ISSN: 0167-6911. DOI: 10.1016/j.sysconle.2021.104895.
- [J1] **G. Nilsson** and G. Como. Apr. 2020. “A Micro-Simulation Study of the Generalized Proportional Allocation Traffic Signal Control”. *IEEE Transactions on Intelligent Transportation Systems* 21.4, pp. 1705–1715. DOI: 10.1109/TITS.2019.2957718.

### *Peer-Reviewed Conference Publications*

- [C23] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. June 2024. “A Blotto Game Approach to Ride-hailing Markets with Electric Vehicles”. Accepted to European Control Conference (ECC) 2024. URL: <https://arxiv.org/abs/2403.16755>.
- [C22] L. Fayed, **G. Nilsson**, and N. Geroliminis. June 2024. “Macroscopic pricing schemes for the utilization of pool ride-hailing vehicles in bus lanes”. Accepted to European Control Conference (ECC) 2024. URL: <https://arxiv.org/abs/2403.16755>.
- [C21] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. Dec. 2023. “Learning How to Price Charging in Electric Ride-Hailing Markets”. *2023 62nd IEEE Conference on Decision and Control (CDC)*, pp. 3136–3141. DOI: 10.1109/CDC49753.2023.10383750.
- [C20] L. Fayed, **G. Nilsson**, and N. Geroliminis. Sept. 2023. “A macroscopic modelling framework for the dynamic pricing of pool ride-splitting vehicles in bus lanes”. Accepted to the 26th IEEE International Conference on Intelligent Transportation Systems (ITSC2023).
- [C19] **G. Nilsson** and N. Geroliminis. Sept. 2023. “On the Equilibrium and Stability Properties of a Macroscopic Model for Ride-Hailing Services with Limited Fleet Size”. Accepted to the 26th IEEE International Conference on Intelligent Transportation Systems (ITSC2023).

- [C18] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. 2023n. “On Finding the Leader’s Strategy in Quadratic Aggregative Stackelberg Pricing Games”. *2023 European Control Conference (ECC)*, pp. 1–6. DOI: 10.23919/ECC57647.2023.10178392.
- [C17] **G. Nilsson** and S. Coogan. Aug. 2022. “A Compartmental Dynamical Network Flow Model for Evacuation Planning of Cities”. *2022 IEEE Conference on Control Technology and Applications (CCTA)*, pp. 1005–1010. DOI: 10.1109/CCTA49430.2022.9966053.
- [C16] Q. Wei, **G. Nilsson**, and S. Coogan. July 2022. “Safety Verification for Urban Air Mobility Scheduling”. *9th IFAC Conference on Networked Systems NECSYS 2022*, pp. 306–311. DOI: 10.1016/j.ifacol.2022.07.277.
- [C15] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. June 2022. “A Pricing Mechanism for Balancing the Charging of Ride-Hailing Electric Vehicle Fleets”. *2022 European Control Conference (ECC)*, pp. 1976–1981. DOI: 10.23919/ECC55457.2022.9838005.
- [C14] C. Santoyo, **G. Nilsson**, and S. Coogan. Dec. 2021. “Sensitivity of Electric Vehicle Charging Facility Occupancy to Users’ Impatience”. *2021 60th IEEE Conference on Decision and Control (CDC)*, pp. 2862–2867. DOI: 10.1109/CDC45484.2021.9682824.
- [C13] M. E. Cao, **G. Nilsson**, and S. Coogan. Aug. 2021. “On the Impact of the Capacity Drop Phenomenon for Freeway Traffic Flow Control”. *2021 IEEE Conference on Control Technology and Applications (CCTA)*, pp. 1037–1042. DOI: 10.1109/CCTA48906.2021.9658952.
- [C12] Q. Wei, **G. Nilsson**, and S. Coogan. May 2021. “Scheduling of Urban Air Mobility Services with Limited Landing Capacity and Uncertain Travel Times”. *2021 American Control Conference (ACC)*, pp. 1681–1686. DOI: 10.23919/ACC50511.2021.9482700.
- [C11] **G. Nilsson** and S. Coogan. May 2021. “Strong Integral Input-to-State Stability in Dynamical Flow Networks”. *2021 American Control Conference (ACC)*, pp. 4836–4841. DOI: 10.23919/ACC50511.2021.9483432.
- [C10] A. Jaafer, **G. Nilsson**, and G. Como. Sept. 2020. “Data Augmentation of IMU Signals and Evaluation via a Semi-Supervised Classification of Driving Behavior”. *2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC)*. DOI: 10.1109/ITSC45102.2020.9294496.
- [C9] C. Santoyo, **G. Nilsson**, and S. Coogan. July 2020. “Multi-Level Electric Vehicle Charging Facilities with Limited Resources”. Vol. 53. 2. 21th IFAC World Congress, pp. 15428–15433. DOI: 10.1016/j.ifacol.2020.12.2364.
- [C8] **G. Nilsson** and G. Como. July 2020. “On Robustness of the Generalized Proportional Controller for Traffic Signal Control”. *2020 American Control Conference (ACC)*, pp. 1191–1196. DOI: 10.23919/ACC45564.2020.9147471.
- [C7] R. Stalberg, **G. Nilsson**, and G. Como. June 2019. “On Robustness of Equilibria in Dynamical Transportation Networks”. *2019 18th European Control Conference (ECC)*, pp. 2209–2214. DOI: 10.23919/ECC.2019.8796234.
- [C6] **G. Nilsson**, P. Grover, and U. Kalabić. Dec. 2018. “Assignment and Control of Two-Tiered Vehicle Traffic”. *2018 IEEE Conference on Decision and Control (CDC)*, pp. 1023–1028. DOI: 10.1109/CDC.2018.8619411.
- [C5] C. Rosdahl, **G. Nilsson**, and G. Como. Aug. 2018. “On Distributed Optimal Control of Traffic Flows in Transportation Networks”. *2018 IEEE Conference on Control Technology and Applications (CCTA)*, pp. 903–908. DOI: 10.1109/CCTA.2018.8511601.
- [C4] **G. Nilsson** and G. Como. June 2018. “Evaluation of Decentralized Feedback Traffic Light Control with Dynamic Cycle Length”. *15th IFAC Symposium on Control in Transportation Systems CTS 2018*, pp. 464–469. DOI: 10.1016/j.ifacol.2018.07.076.

- [C3] **G. Nilsson** and G. Como. July 2017. “On Generalized Proportional Allocation Policies for Traffic Signal Control”. *20th IFAC World Congress*, pp. 9643–9648. DOI: 10.1016/j.ifacol.2017.08.1728.
- [C2] **G. Nilsson**, P. Hosseini, G. Como, and K. Savla. Dec. 2015. “Entropy-like Lyapunov functions for the stability analysis of adaptive traffic signal controls”. *2015 54th IEEE Conference on Decision and Control (CDC)*, pp. 2193–2198. DOI: 10.1109/CDC.2015.7402532.
- [C1] **G. Nilsson**, G. Como, and E. Lovisari. Dec. 2014. “On resilience of multicommodity dynamical flow networks”. *53rd IEEE Conference on Decision and Control*, pp. 5125–5130. DOI: 10.1109/CDC.2014.7040190.

### *Peer-Reviewed Conference Papers Without Proceedings*

- [CP6] L. Fayed, **G. Nilsson**, and N. Geroliminis. Jan. 2024. *On the Pricing of High-Capacity On-Demand Micro-Transit Services Through Macroscopic Dynamic Modeling*. Transportation Research Board (TRB) 103rd Annual Meeting January 7-11, 2024.
- [CP5] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. Sept. 2023. *On fair discounted charging in electric ride-hailing markets with limited budgets*. hEART 2023: 11th Symposium of the European Association for Research in Transportation, 6-8 September, 2023.
- [CP4] L. Fayed, **G. Nilsson**, and N. Geroliminis. Sept. 2023. *On the dynamic pricing of pool ride-hailing services in bus lanes*. hEART 2023: 11th Symposium of the European Association for Research in Transportation, 6-8 September, 2023.
- [CP3] L. Fayed, **G. Nilsson**, and N. Geroliminis. Jan. 2023. *On the dynamic pricing of ride-splitting markets with multi-modal interactions and an occupancy-dependent spatial allocation*. Transportation Research Board (TRB) 102nd Annual Meeting January 8–12, 2023.
- [CP2] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. June 2022. *How different charging prices can contribute to the balancing of ride-hailing services with electric vehicles*. hEART 2022: 10th Symposium of the European Association for Research in Transportation, June 1-3, 2022.
- [CP1] L. Fayed, **G. Nilsson**, and N. Geroliminis. June 2022. *On the utilisation of dedicated bus lanes for ride-splitting services*. hEART 2022: 10th Symposium of the European Association for Research in Transportation, June 1-3, 2022.

### *Under Review*

- [PP2] M. Maljkovic, **G. Nilsson**, and N. Geroliminis. Feb. 2024. “On decentralized computation of the leader’s strategy in bi-level games”. Under review. URL: <https://arxiv.org/abs/2402.14449>.
- [PP1] L. Fayed, **G. Nilsson**, and N. Geroliminis. Sept. 2023. “A Dynamic Macroscopic Framework for Pricing of Ride-hailing Services with an Optional Bus Lane Access for Pool Vehicles”. Under review. URL: <https://arxiv.org/abs/2310.01286>.

### *Patents*

- [P1] U. Kalabić, **G. Nilsson**, and P. Grover. Feb. 2021. “System and Method for Asymmetric Traffic Control”. US Patent 10,922,966.

## Thesis

1. PhD thesis: "On robust distributed control of transportation networks", 2019.  
*Supervisors:* Giacomo Como and Anders Rantzer.
2. Master's thesis: "A multi-commodity dynamical model for traffic networks", 2013.  
*Supervisors:* Giacomo Como and Enrico Lovisari.

## Media Coverage

- October 2019** "Trafikljus som kortar pendlingen". *Traffic lights that shortens the commute time.* Newspaper Tidningen Kollega.
- 11 April 2019** "Ny teknik kan minska bilköerna: 'Man får vänta kortare vid varje trafikljus'" *New technology can shorten traffic queues: 'One has to wait shorter at each traffic signal'* TV4 Nyhetsmorgon, national televised morning show.
- 10 April 2019** "Forskare: Så kan världens bilköer kortas" *Researcher: So can the traffic queues in the world be shortened* Article from the Swedish News Agency TT, that appeared in several national and regional newspapers.
- 10 April 2019** "Nytt sätt att styra trafikljus kan korta bilköer" *New method for controlling traffic signals can shorten traffic queues* Swedish Radio, interviewed in their national news broadcast (Ekot)

## Miscellaneous

*Languages:* **Swedish** native; **English** fluent; **German** basic; **Italian** beginner; **French** beginner.

*Programming Languages:* MATLAB, Julia, C, Python, Java, PHP, SQL.

*Software:* Linux/Unix, QGIS.